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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of:	)	
	)	
Federal-State Joint Board on Universal Service	)	CC Docket No. 96-45
	)	
	)	
Forward-Looking Mechanism for High Cost Support for Non-Rural LECs	)	CC Docket No. 97-160

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SUMMARY

As GTE has consistently stated, a competitive bidding mechanism is the most efficient method to determine the level and allocation of universal service support. Until such a mechanism can be implemented, carrier-specific, state-approved engineering models are the most accurate method of ensuring universal service funding that meets the sufficiency requirement of the Telecommunications Act of 1996. Although neither BCPM nor the Hatfield Model is as reliable as a carrier-specific engineering model in predicting the forward-looking costs attributable to outside plant, BCPM consistently takes more real world factors into account and is based on sounder engineering principles than the Hatfield Model. If use of a cost proxy model is mandated, GTE urges the Commission to maximize use of real-world data and engineering principles, and specifically to take the following recommendations into consideration:

- Because of the large number of factors that must be considered, a cost proxy model cannot adequately account for the plant mix needed to provide universal service. Neither BCPM nor the Hatfield Model has been able to incorporate terrain factors, a critical element of plant mix, into its algorithms. Use of actual data will increase the reliability of any model's results.

- The BCPM approach of prescribing additional costs to account for the additional expenses associated with different plant installation is superior to the factor method used by the Hatfield Model.

- The predetermined drop lengths used by the Hatfield Model do not accurately reflect the facilities needed to serve customers. The BCPM methodology takes factors such as lot size into account and produces more accurate drop length estimates.

- The structure sharing assumptions in the Hatfield Model are not based on sound engineering principles and do not reflect forward-looking practices. Actual sharing practices are a much better predictor of forward-looking sharing plans.

- BCPM loop design is superior to that used by the Hatfield Model approach, which is not based on forward-looking technology and uses dated engineering practices.

- Although the Commission should wait until the proxy model has been selected to make a final determination, the fiber/copper cross-over point should likely be 12,000 feet.

- The most appropriate technology for loop design in a proxy model is the Carrier Serving Area standard.

- Neither BCPM nor the Hatfield Model includes the factors necessary to make proper determinations of when larger digital loop carriers should be used. Actual engineering data will yield more accurate results than either model.

- Because wireless technologies are still not a cost effective substitute for wireline service, the Commission should incorporate wireless technologies in universal service funding allocation only through a competitive bidding mechanism.

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COMMENTS OF GTE SERVICE CORPORATION

GTE Service Corporation and its affiliated domestic telephone operating companies (collectively "GTE")[1] respectfully submit their Comments on the Further Notice of Proposed Rulemaking ("FNPRM") in the above-captioned proceedings.[2] As explained below, neither of the cost proxy models under consideration by the Commission correctly accounts for the outside plant costs required to provide universal service. Although BCPM provides significantly better results than the Hatfield Model, carrier-specific, state-approved engineering models would produce the most accurate cost estimates and would take into account local conditions until a competitive bidding mechanism can be implemented. If the Commission nonetheless decides to use a

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[1] GTE Alaska, Incorporated, GTE Arkansas Incorporated, GTE California Incorporated, GTE Florida Incorporated, GTE Hawaiian Telephone Company Incorporated, The Micronesian Telecommunications Corporation, GTE Midwest Incorporated, GTE North Incorporated, GTE Northwest Incorporated, GTE South Incorporated, GTE Southwest Incorporated, Contel of Minnesota, Inc., and Contel of the South, Inc.

[2] FCC 97-256 (rel. July 18, 1997).

hypothetical cost proxy model, GTE urges the Commission to consider the following recommendations.

I. COST PROXY MODELS CANNOT ADEQUATELY ACCOUNT FOR THE PLANT MIX NECESSARY TO PROVIDE UNIVERSAL SERVICE. (Section III.C.2.a)

GTE agrees with the Commission's tentative conclusions that efficient plant mix is determined by both the distribution of customers and terrain[3] and that neither the Hatfield Model nor BCPM has incorporated terrain factors into its algorithms.[4] These omissions lead to seriously inaccurate estimates of the plant mix needed to serve customers.[5] Although several changes have been made to the Hatfield Model 4.0 to better account for the effects of terrain on outside plant, these changes do not adequately compensate for the Model's inherent shortcomings. In the Hatfield Model 4.0, difficult soil conditions are dealt with by increasing the cost of placement (by applying a multiplier to the base cost; the multiplier varies by soil type) rather than increasing route distances. In addition, this Model version includes the capability of manually varying the method of excavation by line density zone. Despite these changes, however, the Hatfield Model still does not include an algorithm that determines plant mix by terrain type as well as density. The inability of both the Hatfield Model and BCPM to include terrain factors in decisions on outside plant fails to

[3] FNPRM, ¶ 56.

[4] *Id.*, ¶ 58.

[5] *Id.*

accomplish the Commission's goal of minimizing the total lifetime cost of outside plant, including maintenance,[6] and adds further support to GTE's position that proxy models are a poor substitute for state-approved, carrier-specific engineering cost studies based on "real world" network decisions and designs.

Engineering cost studies, in contrast, would accurately reflect both terrain and line density factors. In addition, an engineering cost study would take into account the fact that plant mix is also determined by maintenance requirements and local ordinances. For example, in some locations, a carrier may decide to use underground facilities because the area is subject to extreme wind and rain, which lead to high maintenance costs for aerial cable. Moreover, local ordinances may require that underground cable be used in certain areas for aesthetic reasons regardless of the fact that aerial cable may be more efficient. If the Commission nonetheless decides to use a cost proxy model, GTE supports the tentative conclusion that relatively more feeder and distribution cable should be assigned to aerial installation in wire centers with "hard rock" conditions than those for wire centers with other terrain factors.[7]

II. ACCURATE PLANT INSTALLATION COSTS AND CUSTOMER DENSITY CALCULATIONS ARE CRITICAL TO DETERMINING THE COST OF PROVIDING UNIVERSAL SERVICE. (Section III.C.2.b)

GTE agrees with the Commission's conclusions that a cost proxy model must reflect the different installation costs associated with aerial, buried, and underground

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[6] *Id.*, ¶ 56.

[7] *Id.*, ¶ 58.

cable and that the BCPM approach of prescribing additional costs to account for additional expenses is superior to the Hatfield Model methodology.[8] In addition, the BCPM approach allows users to adjust the costs to reflect actual contractor pricing for the area under study.

The Hatfield Model uses an "a + bx" cost curve to develop the cost of installed cable, without regard to the installation method.[9] This simplistic approach does not accurately reflect the costs that are incurred when installing different types of cable in different terrain and density zones. For example, the Hatfield Model proponents have stated that the additional cost of the messenger strand associated with aerial cable is accounted for by the loaded labor rate,[10] yet the Model uses the same cable costs (which include labor as well as material and engineering costs) for buried and underground installations. It is clear from the falling material and installation labor costs in each successive Hatfield Model version that the messenger strand could not possibly be included in the cable/installation costs assumed in the Model.

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[8] *Id.*, ¶¶ 65-66. GTE disagrees, however, with the Commission's conclusion that density zones should be based on lines per square mile, as in the Hatfield Model. *Id.*, ¶ 67. GTE's Integrated Cost Model uses a combination of lines per square mile, households per square mile, and road feet to determine density. Both the Hatfield Model and BCPM use only one criterion, which could lead to significant inaccuracies.

[9] Hatfield Model Release 4.0 Inputs Portfolio, Section 2.3.3 at 20 (Aug. 1, 1997) ("Hatfield Model Inputs Portfolio") (submitted in Joint Submission of Cost Studies of AT&T Corp. of California and MCI Telecommunications Corp. to California Public Utilities Commission, Docket Nos. R.93-04-003, I.93-04-002, App. B.(Sept. 15, 1997)).

[10] *Id.*, Section 2.4.1 at 23.

The only way to ensure that all additional costs of difficult terrain and varied types of cable are accounted for is to use the actual costs incurred by a carrier.[11] Although the BCPM approach comes closer to including all costs than the Hatfield Model, it too is not as accurate as a carrier-specific engineering model. Carrier-specific engineering models are designed to take the individual characteristics of different geographic areas into account and will thus produce more accurate pictures of density and installation costs.

III. PREDETERMINED DROP LENGTHS DO NOT ACCURATELY REFLECT THE FACILITIES NEEDED TO SERVE CUSTOMERS. (Section III.C.2.c)

The Commission requests comment on whether the model should estimate drop lengths (as BCPM does) or use predetermined lengths for each density zone (as the Hatfield Model does).[12] GTE's own Integrated Cost Model calculates drop lengths which vary from 50 feet to 500 feet depending on such factors as lot size, location of the living unit within the lot, and location of the demarcation point. Because of the many factors that must be taken into account and the vast differences between households, the methodology used by BCPM to estimate drop lengths (which at least considers lot size) produces more accurate results than the predetermined drop lengths

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[11] The additional costs for difficult terrain are often referred to as "extras" in installation contracts and separate charges are assessed based on these types of conditions.

[12] FNPRM, ¶ 74. The drop length is the length of the wire connecting a residence or business to the distribution cable. *Id.*, ¶ 70.

included in the Hatfield Model, which uses line density zones that may be only tangentially related to lot size.

Indeed, other studies and models confirm that the Hatfield Model's methodology underestimates the drop length (and thus the drop investment) incurred by incumbent local exchange carriers ("ILECs"). The Hatfield Model Inputs Portfolio, quoting from a Bellcore survey, indicates that based on the most recent nationwide study of actual loop lengths, the average drop length is 73 feet.[13] However, when the Hatfield Model is used to calculate drop lengths included in the survey, it calculates an average drop length of 64 feet, a twelve percent understatement for the nation as a whole. Moreover, when the Model is used solely for New Hampshire, it calculates a drop length of only 87 feet, which is 30 percent less than the 125 feet estimate produced by the 1993 New Hampshire Incremental Cost Study.[14] GTE expects the Model would produce similar inaccuracies for GTE serving areas.

As with all other outside plant factors, GTE urges the Commission to use drop length results produced by state-approved, carrier-specific engineering models. Only such models, which rely on actual plant deployment, will produce accurate results. If the Commission persists in mandating a hypothetical proxy model, however, it should choose BCPM over the Hatfield Model, because BCPM produces results which are much closer to actual conditions.

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[13] Hatfield Model Inputs Portfolio, Section 2.2.1 at 9.

[14] New England Telephone Company, 1993 New Hampshire Incremental Cost Study at 27 (cited in Hatfield Model Inputs Portfolio, Section 4.8.4 at 103).

IV. THE STRUCTURE SHARING ASSUMPTIONS IN BCPM ARE SUPERIOR TO THOSE IN THE HATFIELD MODEL.

The Commission tentatively concludes that the selected cost proxy model should adopt BCPM's categories for installation activities and terrain conditions and seeks comment on BCPM's estimates for different types of installation activities and structure sharing.[15] The Commission describes structure sharing as "the practice of sharing facilities such as poles, trenches, and conduits with other utilities."[16] The opportunities for sharing structures are a function of installation activity, terrain, and the availability of rights-of-way. GTE agrees with the Commission's tentative conclusion that the installation and terrain conditions categories in the BCPM Model are more accurate than the Hatfield Model assumptions.[17] However, even the assumptions in BCPM are only estimates that will not reflect actual sharing in many areas. The more appropriate way to determine the level of structure sharing is to use actual structure sharing data.

The Hatfield Model's approach to shared infrastructure overestimates sharing and is internally inconsistent. The Model assigns only 33 percent of the underground structure investment to the ILEC in six of the nine density zones used, thus contemplating significant levels of sharing. However, the Model only provides for a duct of minimum size in each conduit run, which would make sharing difficult, if not impossible, in most cases. In addition, the Hatfield Model's use of structure sharing

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[15] FNPRM, ¶ 79.

[16] *Id.*, ¶ 76.

[17] *Id.*, ¶ 79.

percentages for the telephone industry based on the alleged behavior of electric and cable utilities is unsupported by any evidence. Although utilities will likely increase sharing as new facilities are installed, sharing of current facilities is only possible to a very limited extent. Even under the "scorched node" approach which assumes that telephone companies will rebuild their entire networks advocated by AT&T and MCI, electric utilities and cable companies will not be completely rebuilding their networks. Thus, although there may be some sharing of new facilities by different utilities, sharing will not increase to the extent contemplated by the Hatfield Model.

GTE is in complete agreement with the Commission's conclusion that the Hatfield Model incorrectly assumes that carriers share when using cable plows to bury (or install) cable.[18] While such sharing may be technically feasible, it is not a common practice in the industry, a fact attested to even by some Hatfield Model supporters.[19] In addition, the Hatfield Model's sharing assumptions also violate AT&T's own joint trenching guideline which states that "[j]oint trenching should be employed only for distribution cables and service wires, and not for feeder or trunk cables."[20]

The Commission tentatively concludes that a default input value of 66 percent is an acceptable estimate for the percentage of shared facilities assigned to telephone

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[18] *Id.*, ¶ 80.

[19] *See* Transcript of Cross-Examination of Dean Fassett before the Washington Utilities and Transportation Commission, Docket Nos. UT-960369, 960370, 960371 at 324 (July 9, 1997).

[20] AT&T Outside Plant Engineering Handbook, AT&T Network Systems Customer Education and Training at 9-6 (Aug. 1994).

companies.[21] However, the only reasoning provided is that "this value is a reasonable compromise between the values included in BCPM and the values included in Hatfield."[22] Because the percentage of shared facilities used by a cost proxy model will have a critical impact on the estimates of the cost of providing universal service, the Commission must use substantive data for verifying a default value and should not accept 66 percent simply because it is a "compromise" between two parties' estimates. Neither of the models under consideration can provide as accurate estimates of structure sharing as an engineering model incorporating actual data. However, BCPM takes more factors into account and produces more reliable estimates than the Hatfield Model.

V. BCPM LOOP DESIGN, A FIBER/COPPER CROSS-OVER POINT OF 12,000 FEET, AND CARRIER SERVING AREA ("CSA") DESIGN GUIDELINES REFLECT THE FORWARD-LOOKING TECHNOLOGIES THAT SHOULD BE INCLUDED IN A COST PROXY MODEL. (Sections III.C.2.d - e)

A. The Hatfield Model loop design does not comply with commonly accepted engineering principles.

GTE supports the State Joint Board members' conclusion that the BCPM loop design is superior to that used by the Hatfield Model.[23] Although the Hatfield Model 4.0 has eliminated the use of loading coils, it now uses digital loop carriers ("DLCs") on copper-based T1 lines to reach subscribers beyond 18,000 feet from the serving area

[21] FNPRM, ¶ 81.

[22] *Id.*

[23] *Id.*, ¶ 85.

interface. Copper-based T1 lines, however, are not a forward-looking technology; they are a 1970s technology requiring specialized design and cable conditioning and are no longer commonly installed for new systems.

In addition, the copper T1 methodology proposed in the Hatfield Model is technically flawed in two critical respects. First, the Model incorporates "conventional T1 transmission with 6000 ft repeater spacing,"[24] while assuming that 24-gauge copper distribution cable will be used for cable sizes below 400 pairs and that 26-gauge copper distribution cable will be used for cable sizes of 400 pairs or larger.[25] Yet the maximum allowable T1 carrier repeater spacing for 24-gauge air-core PIC cable typically used in aerial construction is 5000 feet, while 26-gauge is limited to 4000 feet.[26] Second, the maximum span length included in the Hatfield Model exceeds the allowable T1 carrier powering range. The Hatfield Model 4.0 allows up to twelve 18,000 foot repeater segments, making the cumulative T1 span line resistance of these segments 11,251 ohms on 24-gauge cable. However, the maximum allowable T1 span line resistance is 8,456 ohms.[27]

The use of small, optical fiber-based DLCs to serve distant customers is a more reasonable and forward-looking technology. This approach is used in BCPM. Because

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[24] Hatfield Model Inputs Portfolio at 37.

[25] *Id.* at 20.

[26] AT&T Practices, T1 Digital Line Transmission and Outside Plant Design Procedures Carrier Engineering (Practice No. 855-351-101) (July 1990).

[27] *Id.*

the Hatfield Model approach is based on dated engineering principles, GTE agrees that the BCPM methodology is preferable.

B. Although the Commission should wait until the proxy model has been selected to make a final determination, the fiber/copper cross-over point should likely be 12,000 feet.

The Commission asks whether the fiber/copper cross-over point should be set at 18,000 feet.[28] It will not be possible for the Commission to establish an appropriate economic fiber/copper crossover point until a complete proxy model mechanism has been selected, including input values. However, based on current proposals, GTE suggests that the Commission adopt a fiber/copper cross-over point of approximately 12,000 feet, based on the use of forward-looking CSA design standards, as discussed below.

C. CSA standards are the forward-looking technology currently used by ILECs.

The Commission requests comment on whether to adopt any loop design standards for the proxy model, and if so, what that standard should be.[29] While GTE agrees that an 18,000 foot copper loop will support the provision of *some* advanced services, CSA is a more appropriate forward-looking standard than Revised Resistance Design ("RRD"). The RRD standard is an urban/suburban design plan that represents a minor modification to the original resistance design standard that was used for approximately 96 percent of all loops prior to the introduction of DLC in 1980. The

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[28] FNPRM, ¶ 87.

transmission design limits associated with at least one commercially available 1.544 mbps high density subscriber line ("HDSL") product constrain copper loops to 12,000 feet of 24-gauge cable or 9000 feet of 26-gauge cable. These HDSL design limits are similar to the CSA design guidelines currently used by ILECs that allow a maximum of 12,000 feet of copper cable when using 19, 22, or 24-gauge cable and a maximum of 9000 feet for copper cable when using 26-gauge cable. Therefore, RRD is not an appropriate standard for a forward-looking environment.

VI. NEITHER BCPM NOR THE HATFIELD MODEL PROPERLY ACCOUNTS FOR THE USE OF DLCS.

In the FNPRM, the Commission requests comment on the number of subscriber lines that should trigger the use of a large DLC.[30] As the Joint Board members noted, the DLC cost data included in both models was inadequately documented.[31] This lack of documentation makes it difficult to evaluate the break points between small and large DLC installations, since DLC size choices are partially based on a cost-per-line comparison, which in turn depends upon the DLC architecture, housing types and sizes, and transport capacity. These factors vary for different DLC vendors. Additional factors that must be taken into account include rights-of-way availability and cost, distribution area or CSA demographics, geography, and service mix.

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[29] *Id.*, ¶ 89.

[30] *Id.*, ¶ 93.

[31] *Id.*, ¶ 92.

Both BCPM and the Hatfield Model fail to include necessary factors.[32] The Hatfield Model ignores common industry practices by not modeling DLC installations in controlled environment vaults ("CEVs" or "huts"), resulting in an understatement of the forward-looking costs of feeder cable. In addition, both models fail to incorporate the use of small fiber-fed DLC remote terminals similar to those currently in use throughout the country. Currently available technology typically includes terminal sizes of 12, 24, 48, and 96 lines.

Similarly, neither model includes loop or switch investment for demultiplexing integrated DLC ("IDLC") loops. This omission contradicts the Commission's conclusion that ILECs "must provide competitors with access to unbundled loops regardless of whether the incumbent LEC uses integrated digital loop carrier technology, or similar remote concentration devices, for the particular loop sought by the competitor"[33] and that the costs associated with unbundling IDLC loops be recovered from requesting carriers. Further, it is unclear whether the IDLC technology included in the Hatfield Model meets the Commission's forward-looking cost technology standard. The demultiplexing arrangement in the Hatfield Model is not yet commercially available, and

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[32] GTE notes that the most recent version of BCPM appears to incorporate more information and be more flexible regarding the choice of DLC sizes and the location of DLCs in the grid. In particular, it appears to allow DLCs to be deployed closer to the loop center and properly uses a 12,000 foot maximum copper loop length. GTE, however, has not had an opportunity to fully analyze the latest version of BCPM. As in other areas, therefore, it is evident that BCPM produces more realistic results than the Hatfield Model, but still does not take into account all the real-world engineering considerations that drive the actual forward-looking costs of providing universal service.

[33] *Implementation of the Local Competition Provisions in the Telecommunications Act of 1996*, 11 FCC Rcd 15499, 15692 (1996).

there is no industry consensus on how it should be implemented. In light of the DS0 hand-off mandated in some interconnection agreements, ILECs may have no choice but to include some universal digital loop carrier ("UDLC") capability in their IDLC central office terminals. The Hatfield Model inappropriately excludes the associated common and per-channel costs associated with a combined IDLC/UDLC configuration. Alternatively, including actual DLC use in carrier-specific engineering models will yield accurate results.

VII. BECAUSE WIRELESS TECHNOLOGIES ARE STILL NOT A COST-EFFECTIVE SUBSTITUTE FOR WIRELINE SERVICE, THE COMMISSION SHOULD INCORPORATE WIRELESS TECHNOLOGIES IN UNIVERSAL SERVICE FUNDING ALLOCATION ONLY THROUGH A COMPETITIVE BIDDING MECHANISM. (Section III.C.2.f)

The Commission requests comment on the cost threshold that should be used to determine when the use of wireless network technologies would be more cost effective than wireline alternatives and the length of time necessary to develop a mechanism which compares the costs of wireless and wireline engineering.[34] Although GTE agrees that in some cases it may be more efficient to employ wireless technologies to provide universal service, the number of factors that must be considered in making this determination are too complex to include in a cost proxy model. In addition, the $10,000 threshold for loop costs included in BCPM is simply not realistic.

The most expensive loops deployed by ILECs are usually associated with customers in rural areas. According to GTE's cost studies, using wireless technologies

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[34] FNPRM, ¶¶ 98-100.

to serve rural areas results in significantly higher costs than use of traditional wireline methods. The costs of cell cites with only limited range, in addition to the costs of the backhaul to the public switched network, switching, and maintenance, significantly exceed the $10,000 included in the BCPM model. Wireless service today also does not reach the same kilobit rates for voice or data service as wireline service and may not satisfy customers who are used to wireline service quality. Further, the propagation characteristics of wireless technologies make it difficult to provide service in areas with natural barriers, such as mountains or canyons.

Although GTE expects wireless technologies to play an important role in serving customers in the future, these technologies are currently not a cost-effective substitute for wireline service. Accordingly, excluding wireless technologies from cost calculations is, at present, consistent with the Commission's conclusion that the mechanism should use the least-cost, most-efficient, technology available.[35] If the Commission implements a competitive bidding mechanism to allocate universal service funding, carriers would of course be free to bid to provide designated services using any technology. This approach would allow market forces to determine the most efficient technology, avoid the inevitable resource misallocations resulting from imperfect modeling, and ensure that no technologies are excluded from universal service funding.[36] Therefore, GTE

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[35] *Id.*, ¶ 101.

[36] *See, e.g.*, Comments of GTE Service Corporation, CC Docket Nos. 96-45, 97-160 at 2 (Sept. 2, 1997).

urges the Commission to include wireless technology cost issues in universal service deployment and funding decisions through a competitive bidding mechanism.

VIII. CONCLUSION

As demonstrated above and throughout GTE's prior filings in this proceeding, a carrier-specific, state-approved engineering model will produce more accurate cost estimates, take better account of local conditions, and better assure sufficient universal service support than a cost proxy model. The Commission should permit use of state-approved engineering models in the interim, pending implementation of a competitive bidding mechanism for determining and allocating universal service funding. However, if a cost proxy model is adopted, GTE urges the Commission to reject the Hatfield Model and incorporate GTE's recommendations into the selected mechanism.

Respectfully submitted,

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